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ABSTRACT

This investigation is concerned with an explanation of the way in which social origins affect the desire for post-secondary education. The author constructs and quantifies a model incorporating influences due to: (1) three reference groups (parents, teachers, peers); (2) the student's academic achievements; (3) his intellectual ability; and (4) his socioeconomic background. The model measures these variables at two points in time, to provide evidence regarding their relative stability over time. The model is quantified separately by sex so as to specify sex differences in the process by which educational aspirations are generated. Conclusions include: (1) the effects of social origins on educational aspirations are indirect through the expectations/aspirations of parents, teachers, and peers (in that order of importance); (2) these effects are more potent and more pervasive for girls; and (3) the role played by academic performance for girls in this process reflects a sex differential in the value placed on higher education. (TL)

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EDUCATIONAL ASPIRATIONS: LONGITUDINAL EVIDENCE ON THEIR DEVELOPMENT IN CANADIAN YOUTH

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The Problem

The accumulated evidence from research into social stratification points clearly to one social fact; in most industrialized democratic nations, and certainly in Canada and the United States, the status attainments of individuals are, in part, a function of the status of their family of orientation. In the face of a basic societal commitment to equality of opportunity such a situation is suggestive of a fundamental social injustice. Thus, a delineation of the mechanisms involved in the transfer of status across generations is important, by virtue of the understanding of a basic social process so provided, and through the potential such an understanding has as a basis for informed policy decisions aimed at the amelioration of this apparent injustice.

Blau and Duncan (1967) provide ample evidence that, at least within the United States, social status is in large part a function of attainments within the occupational structure, and that these attainments owe much to prior educational attainments. With respect to the part played by the latter in the intergenerational transmission of status they note:

> Education assumes increasing significance for social status in general and for the transmission of social standing from fathers to sons in particular. Superior family origins increase a son's chances of attaining superior occupational status in the United States in large part because they help him obtain a better education....
>
> (Blau and Duncan, 1967:430)

An explication of some of the factors implicated in the process by which social origins influence subsequent educational attainments is the central focus of the research reported here.

More specifically, the concern of this investigation is with an explanation of the way in which social origins affect the desire for post-secondary education. This explanation is presented by way of the construction and quantification of a model incorporating influences due to three reference groups (parents, teachers and peers), the student's academic achievements, his intellectual ability and his socioeconomic background. Furthermore, the

model includes measures of these variables at two points in time and, by so doing, provides evidence for the relative stability of their influence over time. Quantification of the model separately with data on each sex allows an additional specification, that of sex differences in the process by which educational aspirations are generated.

The Model

The empirical literature on educational aspirations is substantial. Ohlendorf et al. (1967) list over 300 published and unpublished works relating to educational aspirations and expectations[1] and studies continue to appear in the literature up to the present time; see for example, Sewell et al. (1970). In the interests of brevity this literature is not considered in detail but rather, those findings germane to the investigation at hand are presented along with some observations on apparent deficiencies to which this investigation can speak.

The literature in this area is characterized in its development by increasingly complex attempts to elaborate the socioeconomic status--educational aspirations relationship, a relationship whose magnitude (in correlation terms) varies between 0.2 and 0.5. Not surprisingly, some of the first investigations undertaken were concerned with exploring the possibility that "the apparent effects of parental social status on the youth's levels of aspiration may be due to the common relationship of these variables to intelligence". (Sewell et al., 1957:68). The evidence produced points to the separate and important effects of these two variables; Sewell and Shah (1967:17), for instance, report them as having nearly equal effects on college plans and to be correlated themselves to the order of 0.29.

A good deal of the subsequent research was devoted to understanding the social-psychological variables that mediated the influence of these basic social-structural and psychological characteristics on educational aspirations. Two influences seem of particular importance:

(a) the educational expectations held for the student by his parents, Kahl (1953), Bordua (1960), Boyle (1966a), Rehberg and Westby (1967), Sewell and Shah (1968), Kandel and Lesser (1969); and

(b) the educational aspirations held by the student's peers; Haller and Butterworth (1960), Coleman (1961), Alexander and Campbell (1964), McDill and Coleman (1965), Boyle (1966b), Duncan et al. (1968).

Other family related variables such as sub-cultural value orientations (Kohn, 1963), parental status discrepancies (Krauss, 1964; Cohen, 1965) and family size (Rehberg and Westby, 1967) have also been used to explain both educational aspirations and parental expectations. School related variables such as the expectations of school personnel other than teachers (Herriott, 1963), attitudes toward school, studies and self (Boyle, 1966a), academic achievement (Sewell et al., 1969) and the status consequences of extracurricular activities (Spady, 1970) have also been implicated in this general process.

Brief mention must also be made of attempts at measuring the influence of school context on the individual in this respect. The work of Sewell and Armer (1966) and Boyle (1966b) is illustrative. As this investigation is not attempting to isolate contextual effects no further consideration is given to whatever effects of this nature may be present (but see, however, Haller and Anderson (1969) who carried out such an investigation using data on the same cohort of students under study here).

Within this general context a number of deficiencies are apparent.

1. The influence of the expectations of teachers has received little attention although one would expect that these would be particularly salient for students.
2. Intellectual ability occurs as an explanatory variable in models more often alone than it does in association with school achievement, the visible indicator of ability whose effects, one would anticipate, are more widespread.

3. The validity of the generalizations that are sometimes made is open to question as "samples" vary widely; in size, from Kahl's (1953) 24 common-man boys from Boston to Sewell and Shah's (1968) 10,318 Wisconsin seniors, and in population extent, from the 929 Wisconsin farm-reared male seniors studied by Sewell et al. (1969) to Breton and McDonald's (1967) national sample of 145,817 Canadian high school students.

4. Panel studies, those in which repeated measurements are made on the same subjects at two or more points in time, are few. Hence, inferences regarding the processes involved in the generation of educational aspirations are based on cross-sectional data. One of the liabilities inherent in such analyses results from the tendency to make the implicit assumption that the relative effects of variables are constant over time whereas, in fact, they most probably are not as McDill and Coleman (1965) were able to show with respect to parent and peer influences.

5. While investigations of the development of educational aspirations in Canadian youth do appear in the literature they are relatively few in number. The following appear to be all that consider more than zero-order relationships; Pavalko and Bishop (1966), Boyle (1966b), Pavalko (1967), and Breton (1970). Although one might argue that this limited evidence could be supplemented with that derived from U.S. samples it is probably not legitimate to generalize uncritically from such data. One might wonder, for instance, how much Wisconsin farm-reared males have in common with Canadian students of a similar age.

The present investigation can speak to each of these issues by virtue of its concern with the construction (and subsequent quantification with Canadian data) of a model of the decision-making process that students engage

in throughout high school, a process which culminates in the decision to undertake (or not undertake) post-secondary education, and at which level.

The model developed here adopts a theoretical stance that is implicit in much of the literature just cited, namely, that an individual's attitudes and behaviors are, in part, a function of both the expectations held by significant others and the normative climate of the group of which he is (or aspires to be) a member. Thus, the model derives its theoretical perspective from reference group theory, a theory which "aims to systematize the determinants and consequences of those processes of evaluation and self-appraisal in which the individual takes the values or standards of other individuals and groups as a...frame of reference." (Merton and Rossi, 1957:234). The central concept of this theory may be defined as follows:

> a reference group is a group, collectivity, or person which the actor takes into account in some manner in the course of selecting a behavior from among a set of alternatives, or in making a judgement about a problematic issue. A reference group helps to orient the actor in a certain course whether of action or attitude.
> (Kemper, 1968:32)

In this sense, the relative effects of the expectations/aspirations of parents, teachers and peers are seen as the effects of reference groups on the problematic issue (for the student) of whether to undertake post-secondary education and at what level.

The specific manner in which these reference groups exert their influence upon the student is not at issue here, rather, the focus of this investigation is on the social context in which the influence arises, is exercised, and with what effects. Thus, it is deemed unnecessary to discuss in detail the mode of functioning -- normative/comparative (Kelly, 1949), normative/comparative/audience (Kemper, 1968) -- of each reference group. Suffice to say that the influence of parents and teachers is probably normative in the main, and that of peers via the standard of comparison they provide.

It is argued that three aspects of the social context in which the expectations/aspirations of all concerned arise are particularly important

early in high school; the student's socioeconomic background, his intellectual ability and his achievements within the school. All are seen as potential causes of the expectations/aspirations of the three reference groups and of the student himself. In grade twelve, at the time of the actual decision, the context in which the expectations/aspirations of all concerned are generated is widened to include, along with the variables just mentioned, the student's aspirations in grade ten and his achievement in grade eleven.

In the interests of clarity the hypothesized causal ordering of the variables in question is presented at this point. In Figure I any variable may be considered as a potential cause of all that lie to the right of it; note particularly the time sequences associated with this causal ordering. The variables represented as X_a to X_j are unmeasured residual variables whose nature and function is discussed later. The curved arrow linking X_{11} and X_{12} indicates an unanalyzed relationship. (figure I about here)

Within the context of this model parents, teachers and the student himself have at their disposal both social and non-social criteria on which to base their respective expectations/aspirations. All are aware of (a) what the student <u>is</u> in terms of his social origins and (to varying degrees) his intellectual ability, and (b) what the student <u>does</u> in the way of school achievement. To the extent that each bases his expectations or aspirations on what the student is rather than what he does, then the decision-making process is less than rational, potentially wasteful of human talent and societal resources, and indicative of social injustice.

The main thrusts of the argument indicated by the causal ordering within the model (and some of the expected relationships) can be summarized as follows.

1. Parents and teachers act as reference groups for the student, holding out expectations for his behavior, serving as role models and dispensing rewards and sanctions.
2. The aspirations held by the student's peers provide a standard against

which he can evaluate the appropriateness of his own aspirations.

3. Objective non-social evidence on which to base expectations/aspirations, or to evaluate their appropriateness, is provided by the student's school achievements. Parents, teachers and the student are, it is argued, influenced accordingly, teachers the most and parents the least.
4. One other piece of evidence on which teachers, parents and the student himself may base (or revise) their respective expectations/aspirations for the student's educational future is provided by perceptions (perhaps evidence in the case of teachers) of the student's intellectual ability. Evidence in this respect would seem particularly relevant in the development of expectations/aspirations early in high school when the potential to achieve, accompanied or unaccompanied by demonstrations of achievement, is a legitimate basis for expectations.
5. The postulated socioeconomic status effects on the expectations of parents and teachers and on the aspirations of the student are only well documented in the case of parents and the student. However, Lavin (1965:128) does cite some evidence that children's perceptions of their teachers' attitudes toward them are related to social class.
6. While the effects of socioeconomic status and intellectual ability on school achievement are well established (see Lavin, 1965; Boocock, 1966) the expectation is that socioeconomic status effects are small relative to intellectual ability.
7. In this context one would <u>not</u> want to argue for the student's socio-economic background, inteilectual ability and school achievements as causes of his peers' educational aspirations in the same sense in which they are postulated to be causes of his own aspirations. Rather, the argument is that, in the case of socioeconomic background, common values and other class related factors lead to the increased likelihood of developing relationships with individuals having similar

educational plans. Similarly, as a result of selection processes (e.g., tracking) operating within the school, one's intellectual ability and achievements determine who one's peers will be.

8. Consider now the changes that might be expected to occur over time, between grade ten and grade twelve, as the actual decision approaches.

(a) In connection with the influence of parents and peers, the available evidence suggests that with the formation of adolescent sub-cultures the influence of peers increases over time in relation to that of parents (Coleman, 1961; McDill and Coleman, 1965). However, there is other evidence suggesting that, relative to parents, peers represent a comparatively minor influence (Kandel and Lesser, 1969) and that an increasing orientation toward peers is not necessarily accompanied by a decreasing orientation toward parents (Bowerman and Kinch, 1959). Moreover, there is reason to suspect that the relative influence of parents/peers is related to the issue at hand (Merton, 1957:327) and that in matters pertaining to the "adult world" (as this decision ultimately is, by virtue of its occupational implications) the influence of parents is paramount (Brittain, 1963). Taking this point of view, the expectation is that the influence of parents and teachers (the "experts" in the area to which the decision refers) will increase over time, relative to the influence of peers, as the matter of the decision becomes more critical.

(b) Given that the interval separating the two sets of measurements is only three years one would expect a major determinant of the variables in the second panel to be their counterparts in the first panel. That is, for example, one of the major effects on parental expectations in grade twelve should be parental expectations in grade ten. However, other substantively more

interesting effects are expected;

(i) the effects of the expressed aspirations of the student in grade ten on the expectations of parents and teachers in grade twelve and on the achievements of the student in grade eleven; and

(ii) the effects of the expectations/aspirations of the three reference groups in grade ten on the expectations/aspirations each holds in grade twelve; for example, the expectations expressed by teachers in student report cards, or directly, on the later expectations of parents. Or the possibility that teachers (and perhaps parents) are influenced by the label given to a "peer" group via the tracking processes at work within the school.

9. There seems good reason to anticipate sex differences in the pattern of effects represented by the model. To this end consideration is given to the way in which the particular structuring of sex roles within the society may affect the expectations held by the student's reference groups, especially parents. It is argued here that the recognized importance of educational attainments for subsequent occupational attainments, and the importance of the latter for placement within the social structure, along with the social definition of sex roles that casts males as the family provider and proscribes a limited occupational career for women, results in a differential valuation of educational attainments by sex. That is, educational attainments are seen as having considerable instrumental value for males whereas for females such attainments are regarded as having limited instrumentality at best. Given a lower valuation of these attainments for girls one might expect the following sex differences:

(i) stronger and more extensive socioeconomic background effects

for girls; parents with limited economic resources being, on the whole, unwilling to commit scarce family resources to an extended education with little apparent pay-off, and teachers seeing this as the way the world operates; and

(ii) for girls, a stronger influence due to school achievements on the expectations of parents and teachers, a product of the belief that while education is good for all it is only necessary for boys and, as a result, males should have every chance, females only if they show evidence of their ability to succeed.

10. Seven relationships within the model remain unanalyzed, those between socioeconomic background and intellectual ability, and between the expectations/aspirations of reference groups in each of the two panels. To argue for a cause-effect relationship between social origins and intellectual ability adds nothing to the main arguments presented, in fact, such a relationship alters the model not at all, quantitatively. With respect to the other unanalyzed relationships there seems no safe ground on which to base an argument for asymmetric causal relationships. Most likely the causal influences are reciprocal each influencing the others within each panel, a situation almost impossible to quantify. Thus the expectations/aspirations of parents, teachers and peers within each panel are shown determined independently of each other by the variables that precede them.

11. The temporal ordering of the variables for each relationship is, for the most part, clear cut as the time sequences in Figure I indicate. The sole exceptions are those involving the expectations/aspirations of the reference groups as causes of the student's aspirations. There is no accepted method[2] for establishing causal priorities among these variables and, hence, the assumption is made that the causal relation-

ships indicated reflect reality, at least insofar as the direction of the major causal influence is concerned.

Quantification of the Model

Data

Panel data were obtained from the Carnegie Human Resources Data Bank. These data were collected on all Ontario students in grade nine in 1959-60 and in each subsequent year to grade thirteen. Some 90,000 students were enrolled in grade nine in 1959-60 and approximately 30,000 of these entered grade twelve in 1962-63. A random sample of 5,000 grade twelve students was selected. Of these 3,687 (1,809 males and 1,878 females) were enrolled in programs leading to qualifications suited to post-secondary education, and data on these were used in the actual analysis.

Variables

Complete descriptions of the questionnaires and tests administered can be found in MacEachern (1960), Brehaut (1964) and D'Oyley (1964). The following is a description of each variable selected for use in this investigation.

(a) *Socioeconomic Background* (X_{11}). This was indexed by father's occupation. The eight categories of occupation conform to the usual pattern and were ordered according to the socioeconomic index of Canadian occupations developed by Blishen (1967).

(b) *Parents' Expectations* (*grade ten*, X_8; *grade twelve*, X_3);
Teachers' Expectations (*grade ten*, X_7; *grade twelve*, X_2);
Peers' Aspirations (*grade ten*, X_9; *grade twelve*, X_4); and
Student's Aspirations (*grade ten*, X_6; *grade twelve*, X_1).

Subjects were asked to respond to similarly worded questions regarding their own educational and work plans, what their teachers and parents suggest they do, and what most of their friends plan to do. Seven responses were provided, ranging from "Complete secondary school then enter university." to "Leave

school as soon as possible to obtain a job or work at home."[3]

(c) *School Achievement (grade nine, X_{10}; grade eleven, X_5).* The measure used was the student's grade point average.

(d) *Intellectual Ability.* (X_{12}). The student's score on the Canadian Academic Aptitude Test I (verbal ability) was taken as the measure of his intellectual ability.

Method

As the causal nature of the model might suggest the system of relationships specified was quantified using the technique of path analysis (see Wright, 1934, Duncan, 1966; Land, 1969; Heise, 1969). Path analysis is a variety of multivariate analysis based on multiple linear regression procedures and aimed at the mathematical specification of a closed system of variables (such as the model presented above). While causality may not be inferred from this type of analysis the relative magnitudes of cause-effect relationships specified by the investigator can be determined, given certain assumptions.

The variation of any particular variable within the system (e.g., parent's expectation in grade ten) is considered completely determined by those variables specified as its causes (socioeconomic background, intellectual ability, school achievement grade nine) and by an unmeasured variable (the residual, X_h) which accounts for that part of the variation in the dependent variable not explained by the specified causes. Thus, an individual's score on any particular variable may be represented as the weighted sum of the values of its causes plus the residual; such a structural equation is isomorphous with the normal equations of multiple linear regression. Specifying the above example in this way yields the following structural equation:

$$X_8 = p_{8.10}X_{10} + p_{8.11}X_{11} + p_{8.12}X_{12} + p_{8h}X_h$$

The weights assigned each cause (the p_{ij}) are path coefficients and each represents the relative magnitude of the cause-effect relationship holding constant all other relevant causes. In the analysis they are expressed as standardized partial

regression coefficients (beta weights) and may be interpreted thus; as the change (in standard deviation units) produced in a particular dependent variable by a one-unit change (in standard deviation units) in the independent variable in question, holding constant all other relevent causes. For example, holding constant X_{11}, X_{12} and X_h, a one standard deviation change in X_{10} will produce a "$p_{8.10}$" standard deviation change in X_8, parents' expectations.

On this basis a series of structural equations can be developed to specify the particular causal model proposed. The following series was developed to represent the causal model pictured in Figure 1.

$$X_1 = p_{12}X_2 + p_{13}X_3 + p_{14}X_4 + p_{15}X_5 + p_{16}X_6 + p_{17}X_7 + p_{18}X_8 + p_{19}X_9 + p_{1.10}X_{10} + p_{1.11}X_{11} + p_{1.12}X_{12} + p_{1a}X_a$$

$$X_2 = p_{25}X_5 + p_{26}X_6 + p_{27}X_7 + p_{28}X_8 + p_{29}X_9 + p_{2.10}X_{10} + p_{2.11}X_{11} + p_{2.12}X_{12} + p_{2b}X_b$$

$$X_3 = p_{35}X_5 + p_{36}X_6 + p_{37}X_7 + p_{38}X_8 + p_{39}X_9 + p_{3.10}X_{10} + p_{3.11}X_{11} + p_{3.12}X_{12} + p_{3c}X_c$$

$$X_4 = p_{45}X_5 + p_{46}X_6 + p_{47}X_7 + p_{48}X_8 + p_{49}X_9 + p_{4.10}X_{10} + p_{4.11}X_{11} + p_{4.12}X_{12} + p_{4d}X_d$$

$$X_5 = p_{56}X_6 + p_{57}X_7 + p_{58}X_8 + p_{59}X_9 + p_{5.10}X_{10} + p_{5.11}X_{11} + p_{5.12}X_{12} + p_{5e}X_e$$

$$X_6 = p_{67}X_7 + p_{68}X_8 + p_{69}X_9 + p_{6.10}X_{10} + p_{6.11}X_{11} + p_{6.12}X_{12} + p_{6f}X_f$$

$$X_7 = p_{7.10}X_{10} + p_{7.11}X_{11} + p_{7.12}X_{12} + p_{7g}X_g$$

$$X_8 = p_{8.10}X_{10} + p_{8.11}X_{11} + p_{8.12}X_{12} + p_{8h}X_h$$

$$X_9 = p_{9.10}X_{10} + p_{9.11}X_{11} + p_{9.12}X_{12} + p_{9i}X_i$$

$$X_{10} = p_{10.11}X_{11} + p_{10.12}X_{12} + p_{10j}X_j$$

Values for the path coefficients can be obtained by regressing the "effect" on all the postulated "causes",[4] that is, in the example used above, regressing parents' expectations in grade ten (X_8) on socioeconomic background (X_{11}), intellectual

ability (X_{12}) and school achievement grade nine (X_{10}). The beta weights obtained are equivalent to path coefficients in this case. Thus, for example, the beta weight associated with socioeconomic background may be considered as the path coefficient representing the relative effect of the student's social origins on the expectations held by his parents, and similarly for the other causes, intellectual ability and school achievement. The path coefficient representing the effect due to the residual variable is given by the square root of the coefficient of alienation ($1-R^2$). Alternatively, the square of this path coefficient is the proportion of variance unexplained by specific variables in the model.

Values for the path coefficients can only be obtained if certain simplifying assumptions are made. The set of assumptions underlying path analysis generally is outlined in Heise (1969), however, those assumptions made in connection with the residuals call for some comment at this point. In many cases the residuals are assumed uncorrelated with the other causes of the variable in question and with each other.[5] An exception to the latter assumption may be made where relationships within the model are assumed causally independent, for example, those between the expectations/aspirations of the three reference groups in each panel. In this case the assumption is not necessary for a determinate solution of the relevant equations and the correlation between the residuals may be calculated rather than assumed to be zero. This correlation is analogous to the correlation between the two variables with which the residuals are associated when the effects due to prior causes are partialled out. In our example the correlation between residuals X_g and X_h (associated with parents' and teachers' expectations in grade ten) is the partial correlation between parents' expectations and teachers' expectations at grade ten controlling for the effects of socioeconomic background, intellectual ability and school achievement. Note, however, that the residuals X_a, X_e, X_f and X_j are each assumed uncorrelated with the

other residuals and with the relevant causes.

It is conceivable in models of this sort that not all the potential causes of a variable have <u>direct</u> effects on that variable, for example, the student's intellectual ability may not influence his parents' expectations directly but only through the school achievements that it allows. If this were so the appropriate structural equation could be written thus;

$$X_8 = p_{8.10}X_{10} + p_{8.11}X_{11} + p_{8h}X_h$$

That is, the path coefficient $p_{8.12}$ is considered zero and that causal path would not appear in the model.[6]

In the determination of which paths should be included in the model and which should be eliminated two basic strategies are used. On the one hand, paths may eliminated or retained on purely theoretical grounds. On the other hand, all possible paths may be included in the first instance and, on the basis of the results of the analysis, insignificant paths may be dropped and the values of the remaining path coefficients recalculated. The degree to which the correlations implied by the resultant model match the observed correlations between variables allows a test of the adequacy of the model. The second of the two strategies was adopted here.

<u>Measurement</u>

All calculations presented here are based on product-moment correlations. The variables in question were measured on either interval scales (intellectual ability and school achievement) or ordinal scales (the remaining variables). Labovitz (1967;1970) has shown that one is fairly safe in treating ordinal data as if it were interval and is justified in doing so in order to utilize the more powerful parametric statistical techniques. His arguments were taken as sufficient justification to treat these data in this way to produce correlation matrices for males and females. However, the first of a number of measurement problems faced must be mentioned. The distributions for most variables were less than normal, owing perhaps to the select nature of the sample, and hence one of the assumptions underlying product-moment correlations

is met only to varying degrees.

Of greater concern are the potential effects of non-response. Each correlation was based on all cases for which data were available and hence the correlations are based on somewhat different numbers of cases in each instance. Table I presents these correlations and the total non-response for each of the twelve variables, by sex. (Table I about here)

Concern with the potential bias introduced by the effects of non-response arose from the following observations;

(i) non-response by individual variable ranges from less than two percent in the case of intellectual ability (girls) to slightly more than forty-seven percent in the case of the boys' reports of the expectations their teachers hold for them;

(ii) the non-response rate for each variable is roughly comparable between sexes;

(iii) the non-response rate at grade twelve is slightly higher in most cases;

(iv) twenty-seven percent of the sixty-six correlations produced for males are based on less than half the number of possible cases; for girls the figure is twenty-one percent. Almost without exception these correlations involved the variable with the highest non-response rate--teachers' expectations.

Thus, one might want to entertain some reservations with regard to the notion that these correlations reflect their population values, especially those correlations involving teachers' expectations. The assignment of mean values to missing observations or their random proportional assignment among the categories of each variable seemed no more justified than assuming non-systematic effects due to non-response. The assignment of means to missing data was, in fact, carried out and, as one would expect, attenuated the correlations (on the average about 0.070). Since there appears no clear-cut way of handling

non-response, especially non-response of this magnitude, the assumption of non-systematic effects was made and correlations based on the reported scores were used in the analysis.[7] Any conclusions drawn must, of course, be tentative in view of this.

In an attempt to gain some leverage on the data in this respect two separate causal models were quantified, each with a different assumption about teachers' expectations. In Model I, the one originally proposed, non-systematic effects were assumed in connection with the non-response to teachers' expectations and the other variables. In Model II the assumption was made that the high non-response to the teachers' expectations question reflected a general non-influence of teachers in this process, at least as referents. Thus, teachers' expectations were eliminated from consideration but otherwise the model is analogous to Model I. In this way it was hoped that a comparison of Model II with Model I for both boys and girls would allow something of an insight into the way the potentially unreliable correlations based on teachers' expectations affect the path coefficients estimated from the remaining (somewhat more reliable) correlations. For example, if the pattern of effects among the variables other than teachers' expectations differed markedly between models than one would suspect that this variable was in some way, altering the internal properties of the correlation matrix such that the estimates of the path coefficients were unstable. This would not, in and of itself, indicate that the correlations involving teachers' expectations were not their true population values but it would point to the inadvisability of including the variable under these circumstances. On the other hand, if the pattern of effects remained more or less the same then nothing is lost by using the more inclusive model and making appropriately qualified conclusions about the role of teachers' expectations in this decision-making process.

Results

In each of the four models (Models I and II by sex) all possible paths

were computed initially. In the second step those path coefficients not greater than twice their standard error were eliminated[8] and the remaining path coefficients recalculated. Where the correlations implied by each of these models[9] deviated by more than 0.05 from the observed correlations paths were re-entered and the path coefficients adjusted accordingly. In a number of instances further deletions of paths were attempted in the interests of parsimony. The resulting models represent the end-product of this reductive process.

The results of this analysis indicated that Model II would lead to essentially the same conclusions as Model I although nothing, of course, would be said about the role of teachers' expectations in the process. Thus, the second of the two alternatives proposed above is adopted; the results of Model II are not presented but rather that which follows is based on the results for the more inclusive Model I.

The results of the quantification of Model I are presented, separately for males and females, in Table 2, which indicates the path coefficients and residuals for each model. Table 3 represents the deviations of the correlations implied by Model I from the observed correlations, separately for males and females. (Tables 2 and 3 about here)

A presentation of the models in the more usual manner -- in the form of a path diagram showing cause-effect relationships by arrows with associated path coefficients -- was not attempted as the number of paths made the reading of these diagrams somewhat difficult. The model for males had, for example, forty paths aside from the residuals. Instead, models showing only the larger effects (0.150 or greater) are presented in Figure 2. (Figure 2 about here)

Careful note should be taken of the fact that the path coefficients shown in Figure 2 were taken directly from Table 2 and are <u>not</u> those that would result from a system of relationships as shown in Figure 2. Such a system would not adequately reproduce the observed correlations as too many paths have been deleted. Arrows connect cause and effect with the effect

lying at the head of the arrow and path coefficients are presented in connection with each arrow. Residuals are represented by broken lines and the correlations between them by curved lines. The unanalyzed relationship between socioeconomic background and intellectual ability is represented by a curved double-headed arrow and the magnitude of the relationship by a zero-order correlation.

Discussion

The preceeding models offer four basic types of information;

(i) the relative effects of specific variables at each of two points in time,

(ii) changes in the magnitude of these effects over time,

(iii) patterns of effects that might be interpreted as manifestations of underlying social processes, and

(iv) sex differences in all of these.

This information is used to offer some insights into under-researched aspects of the educational decision-making process; namely, in connection with the role of teachers' expectations and school achievement, changes in the relative influence of variables over time, and overall, knowledge of the processes at work among Canadian youth. However, throughout this discussion the reservations made earlier in connection with the problems of contaminated measures, skewed distributions, non-response and multicollinearity must be kept in mind. In the light of this the conclusions drawn will not be as fine-grained as they might have been but rather, will be concerned with the more gross aspects of the decision-making process as reflected in the models.

Consider in the first instance the educational aspirations of the student and the influences due to the three reference groups. For males in grade ten the influence of parental expectations (0.549) is approximately twice that of teachers' expectations (0.250) and these in turn are roughly twice as important in the determination of the student's aspirations as

are the aspirations of peers (0.118). This ranking is maintained over time with parents gaining in influence at the expense of teachers and peers. A small effect (0.080) due to what must be assumed as the student's perceptions of his own intellectual ability is present in grade ten but not at grade twelve. Note too that there is a certain amount of consistency between the aspirations boys hold in grade ten and those held in grade twelve, as represented by the effect (0.258) of grade ten plans on grade twelve plans. The remaining effects on the student's aspirations in grade twelve consist of a small influence due to his grades in the previous year (0.041) and two apparently anomalous negative effects originating from the expectations of parents and teachers in grade ten.[10]

An examination of the model for girls presents a similar picture but with certain seemingly important differences. In rank order the influences of the three reference groups in grade ten follow that of boys, the expectations of parents assume most importance (0.633), those of teachers follow (0.222) and of least influence are the aspirations of the student's peers (0.063). However, contrary to the situation for males, the aspirations of peers and the expectations of teachers gain in influence over time at the expense of parents' expectations. Also, whereas in grade ten these expectations/aspirations are the sole influences (within this model) on the student's aspirations, in grade twelve the influences of the three reference groups are supplemented by an effect due to the student's earlier aspirations (0.134) and by a negative effect arising from the expectations of parents in grade ten (see footnote 10).

One might also note in passing that, given the assumption about the reality of the student's report of his referents' expectations/aspirations, the model explains 68% of the variance in the grade ten plans of males, 67% of the variance for girls at this time, 81% of the variance in the educational aspirations of boys in grade twelve, and 77% of the variance of the plans girls hold in grade twelve.

Before attempting a description of the antecedents of these expectations/ aspirations held by the student's referents some more interpretive comments on the direct effects of the reference groups seem possible. In terms of relative importance the influence of adults as reference figures far exceeds that of the student's peers, a situation that offers support to the argument that the influence of reference groups is not generalizable across all situations but is, rather, a function of the perceived expertise of the referent for the issue at hand. It was predicted earlier that the occupational implications of educational attainments made this a decision pertaining largely to the adult world and hence, that the adult reference figures would be more influential than peers. The data provide further support to this interpretation when changes in the relative effects of the three reference groups are considered by sex. The concern of parents with the occupational (and hence, socioeconomic) future of their sons is taken to be reflected in the increasing influence of parents' expectations over time. A reduced concern for girls in this respect is thought to underlie the increasing influence over time of the expectations/ aspirations held by teachers and peers at the expense of parents. In other words, it is argued that the educational decision to be made has (a) occupational implications that establish adults as the appropriate reference figures and (b) a greater saliency for males such that parental interests and influences are maximized whereas for girls, where the decision is regarded as being of less import, the conduct of non-parental figures (peers and teachers) assumes more importance (more or less by default).

Attention must also be directed at this time to the absence of predicted influences, notably those from school achievements. While it was predicted that the student's academic performance would influence his plans, especially at the time of the actual decision, in fact, school achievement in grade eleven has only a minimal direct influence on the decision boys make and a negligible effect on the aspirations girls hold in grade twelve. These data suggest

then, that neither boys nor girls subject their aspirations to a critical appraisal in the light of demonstrations of their ability to handle an extended education. As it turns out, the indirect influences of this variable (through the expectations/aspirations of referents) for boys are also minimal but not so for girls. This matter is taken up again at a later point.

These conclusions are other than one would expect and the question of error arising from the variety of measurement problems mentioned earlier must be raised. Nevertheless, Sewell et al. (1969) also report the absence of a direct effect of school achievement on educational aspirations. Later work (Sewell et al., 1970) with other samples, however, shows the effect to be present.

Having considered the direct causes of the major variable of interest, educational aspirations, it remains to examine the antecedents of the expectations/aspirations of the three reference groups, that is, in one sense, to examine the indirect effects of these antecedents on educational aspirations through their influences on the expectations/aspirations of the three reference groups.

Not surprisingly, intellectual ability emerges as the major cause of school achievement in grade ten for both boys and girls. Socioeconomic background effects on achievement appear minimal, although it must be remembered that this is to some extent a select group of students (those who made it through high school to grade twelve). As determinants of who the student's peers will be, and hence what aspirations they will hold, of these three variables socioeconomic background emerges as the most powerful influence for both boys (0.142) and girls (0.189). The remaining two variables, intellectual ability and grade nine achievement, contribute slightly more to the determination of peers' aspirations for boys than is the case for girls.

Socioeconomic background also plays a major role in the determination of parents' expectations in grade ten, an effect of 0.198 for boys and 0.245 for girls. The remaining causes are reversed in order of magnitude between the

sexes, parents perceptions of their sons' intellectual ability being second in importance for males, while grade nine achievements assume this position as a cause of the expectations of girls' parents.

As causes of the expectations teachers hold in grade ten the three variables in question are ranked similarly for both boys and girls; in order of importance, intellectual ability (probably known to teachers), grade nine achievements and socioeconomic background. The latter two are somewhat more influential in the case of girls.

The following is one set of possible meanings that can be assigned to these patterns of effects.

(1) Socioeconomic background effects on peers' aspirations reflect a socioeconomic segregation of students by school, a consequence, perhaps, of socioeconomic segregation within the community. The remaining causes are taken to be a reflection of segregation within the school on the basis of intellectual ability and academic performance, that is, ability grouping. All three causes determine who the student's peers will be rather than affecting directly the aspirations they hold.

(2) The particular configuration of effects that characterizes the expectations parents hold in grade ten differs for each sex and is taken to be a reflection of the joint action of,

(i) a belief that the instrumental value of an extended education is much greater for boys than for girls;

(ii) a socioeconomic differentiation of families in terms of the value placed on education per se; and

(iii) a parallel differentiation of families according to the resources they have to support an extended education.

For boys, it is argued that (i) offsets the effects of (ii) and (iii) as indicated in the reduced socioeconomic status influence and, in addition, (i) underlies the greater influence of educational potential

(intellectual ability) over demonstrated ability to handle matters academic (i.e. school achievement). The parents of girls, it seems, subject their expectations to a more objective appraisal in the sense that they are influenced by performance over potential.

(3) The causes of teachers' expectations in these early years of high school are much as one would expect, with the student's potential valued over his performance and both of greater influence than his social origins. The only sex differences appear in the magnitude of the effects, all effects for girls being greater than their counterparts for boys. This might be interpreted as a consequence of teachers regarding an extended education for girls as somewhat problematic and contingent largely on their performance and ability (only the best girls go on, as it were, whereas only the worst boys do not). In this sense indicators of ability and performance assume more importance for girls than for boys in the development of expectations in teachers.

Consider now the second panel of measurements and the links between the panels. Contrary to what might be expected, the educational plans of students in grade ten do not appear to affect their grades in the following year. The major effects for both boys and girls are their earlier achievements and intellectual ability, with additional effects due to peers' aspirations in the case of boys (0.082) and to teachers' expectations for girls (0.100). One is led to the unanticipated conclusion that the motivational influences represented by the expectations/aspirations of the three reference groups and of the student himself play little part in determining academic performance. The major influence in this respect is intellectual ability both directly and indirectly through earlier achievements. These observations are in contradiction to the implications one would draw from the Turner (1964) argument that ambition affects intellectual performance rather than the reverse (see in this context Rehberg et al., 1970).

Within the model the expectations/aspirations of the three reference groups in grade twelve are potentially subject to the direct influence of eight causes. All, however, are in actuality directly influenced by less than eight. In the case of peers' aspirations the pattern of effects is similar for both boys and girls with the single exception that parents' expectations for boys in grade ten influence (0.183) who their peers will be in grade twelve. The causes common to both males and females in this respect are socioeconomic background, academic performance in grade nine, peers' aspirations in grade ten, and teachers' expectations in grade ten.

Viewed as essentially a process of selecting who peers will be rather than an influence on aspirations directly, the results suggest the following interpretation. The peers with which a student interacts are selected by factors within both the family and school. Family influences are represented by the effects of socioeconomic background and parental expectations (for boys) influencing who the friends will be via socioeconomic segregation within the community, as a result of common class values, attitudes, beliefs and behaviors, and perhaps, through conscious encouragement on the part of parents to associate with peers whose educational ambitions match those parents hold for their own child. Within the school the effects of grade nine achievements and grade ten teachers expectations are seen as reflections of the ability grouping that characterizes schools (at least during the period of the study). Students are assigned to ability groups, in part, as a result of their early achievements together with the predictions teachers make regarding their ability to undertake further education.

Sex differences in the configuration of causes are more apparent in connection with parents' expectations in grade twelve. The influence of the analogous expectations in grade ten for boys (0.451) is more than twice that of girls (0.214). The student's own aspirations in grade ten also have a greater influence in the case of boys (0.287 vs. 0.160). Note however, that

whereas the direct influence of socioeconomic background has disappeared for males it is maintained within the model for females (0.180). Sizable sex differences also exist in connection with grade eleven school performance, the influence on boys parents (0.089) being considerably less than for girls (0.201).

The pattern of effects observed here allows an interpretation similiar to that made in connection with parents' expectations in grade ten. As a result of the differential valuation of educational attainments by sex, socioeconomic background and achievement effects remain important for girls but not for boys. The parents of boys are subject to greatest influence at this stage from the expectations they held earlier and from the early aspirations of their sons. It seems that boys' parents remain relatively unaffected in the development of later expectations for their sons educational future by their own social and economic statuses (except as they may exert an indirect influence through earlier expectations), by evidence of his ability or performance, by the expectations of his teachers or by the aspirations of his friends. The latter three do,however, exert small influences in this respect. Furthermore, these parental expectations show a high degree of consistency over time, as the effect of 0.451 and a correlation of 0.657 show.

With girls the expectations of parents continue to be contingent on school performance and the socioeconomic status of the family, although the student's own wishes do exert some influence. The "contingency" aspect of parents expectations for girls is reflected in the moderate to low degree of consistency of these expectations over time. Grade ten parental expectations have an effect on their grade twelve counterparts of 0.214 and a zero-order relationship of 0.496.

The expectations of the remaining reference group, teachers, show a pattern of causes in grade twelve that differs substantially between the sexes. For boys the two major direct effects are due to the early expectations

of parents (0.250) and the early aspirations of the student himself (0.206). These are supplemented by three roughly equal effects arising from the student's intellectual ability (0.097), his grade nine achievements (0.110) and the aspirations of his peers in grade ten (0.107). For girls the major influence is from the earlier expectations of teachers (0.223), followed by the student's early aspirations (0.182), her grade eleven achievements (0.147), her grade nine performance (0.146), her socioeconomic background (0.121) and finally the expectations of her parents earlier in high school (0.096).

Given the assumption about the reliability of the data on teachers, this pattern of effects suggests that teachers are influenced in their expectations for boys by what the boys parents and the boy himself expect the student will do rather than by evidence of what he <u>can</u> do at this stage; the absence of an effect from grade eleven academic achievements onto teachers' expectations is a little difficult to accept and casts some suspicion on the quantitative accuracy of the data. However, when this is considered along with the effects due to intellectual ability, grade nine achievements and grade ten peers' aspirations at least one plausible interpretation is suggested. Teachers are influenced in the expectations they hold for boys in grade twelve not so much by the student but by the educational expectations held for the ability group (of which the student is a member) by the school as a whole. That is, intellectual ability and grade nine academic performance determine a student's membership in an ability group and it is the status of this group (assigned by the school) rather than later achievements that influences what teachers expect. Such an interpretation would also explain the effects of peers' aspirations in grade ten on the expectations of teachers at this stage, the aspirations of the student in question being identified with the general aspirations of the group. It also suggests that the particular structural arrangements of the school may be crystallizing the expectations (and hence influence) teachers may have, in effect, tending to lock the student

into an expected future based on early achievements and unaffected by later changes, at least as far as teachers are concerned.

On the whole, the pattern of effects leading to teachers' expectations for girls is similar to that associated with parents' expectations, although there are differences in the magnitude of the analogous relationships. The single exception, the effect of early school performance, might be seen as for boys, a consequence of ability grouping within the school. Such a situation suggests at least the following interpretation. Teachers are aware of, perhaps subscribe to, a widely held belief in the non-necessity of an extended education for girls and, as a result, hold out expectations for only the most productive girls. Furthermore, they are also influenced in the formation of these expectations by statuses assigned the student by the school in previous years, by the amount of support the girl may expect from her family, and finally by the girls own ambitions.

Overall, the interpretations suggested by the data point to the student as being a somewhat passive object whose educational ambitions, at least, are molded by socialization pressures in his family and school environments. Moreover, in the case of boys, the major agents of socialization (the student's parents) remain remarkably insulated from objective evidence of the student's capability to live up to their expectations for him. In fact, within this model evidence of the student's academic performance plays a surprisingly minor role, being most influential where girls are concerned and, even then, not affecting the student directly. In essence, the data suggest a largely non-rational decision-making process.

Conclusions

Given the qualifications discussed earlier with regard to the measurement problems encountered, this investigation points to the following general observations about the decision-making process that student engage in during high school.

1. The effects of social origins on educational aspirations are indirect through the expectations/aspirations of parents, teachers and peers. These effects are more potent and more pervasive for girls than for boys, a result, it was speculated, of the belief that the instrumental value of an extended education differs between the sexes, and that educational ambition should be engendered accordingly.
2. The major influences on the aspirations of the student are, in order of importance, the expectations of parents, the expectations of teachers and the aspirations held by peers. This ranking is maintained over time and offers support to the argument that the relative influence of reference groups is specific to the decision at hand, in this case, a decision with "adult-world" implications and hence one referred to adult referents. The reduced saliency of this decision for girls is reflected in an increased influence over time for peers along with a decreasing impact of parents' expectations.
3. The apparent role played by academic performance in this process was unanticipated. The relatively minor influence for boys suggested that all concerned based their respective expectations/aspirations largely on non-objective criteria. Whereas this was not the case for girls, the situation was interpreted as being a further reflection of the sex differential in the value placed on higher education. Boys, so to speak, are given every chance, girls have to demonstrate their capabilities throughout high school.
4. In general the models suggest that students do not subject their aspirations to any sort of realistic appraisal in the light of their academic performance. Rather they are a product of the expectations/aspirations of those figures in their interpersonal environment who assume some significance for the student; his parents,

his teachers and his peers. Furthermore, the student's own educational ambitions have no effect on subsequent academic performance, a situation suggesting that the student takes less than an active part in this whole process. As far as the expectations/aspirations of the three reference figures are concerned, it was argued that the particular configurations of causes, and changes in these over time and between sexes, were the manifestations of the joint influence of three basic social forces (i) a belief that the instrumental benefits of educational attainments are critical for males, because of their occupational implications, but are less so for females, (ii) a socioeconomic differentiation of families in terms of their resources to support an extended education, and (iii) a similar differentiation in terms of the overall value placed on educational attainments.

While suggesting that educational aspirations are essentially the products of socialization pressures and, that these in turn are influenced largely by non-rational criteria, it is as well to point again to the potential sources of error mentioned earlier. The models themselves are internally consistent systems that reflect accurately the properties of the correlation matrices in question, however, in obtaining these correlations certain assumptions about the data have been met only to varying degrees. With these doubts about the validity of the data only the more gross aspects of the models can be considered to the end that they offer potential as Hauser (1970:124) suggests: "The value of model construction does not lie in the results of any single effort, but in the potential for criticism, reconsideration, replication, and cumulation of analytic findings which it creates."

Footnotes

1. The distinction made here between aspirations and expectations is basically one referring to the intrinsic-extrinsic nature of the motivation to achieve some desired future state. Aspirations refer to the desires individuals have for themselves, expectations to the desires individuals have for the future status of others. Thus, aspirations is used in the case of the student and his peers, both of whom desire some future educational state for themselves, while expectations is used to refer to the desires of parents and teachers for the future status of the student. Other distinctions between aspirations and expectations have been made. Brookover et al. (1967), for example, propose that a distinction be made in terms of what the student hopes to do as against what he predicts he will do.

2. The technique proposed by Pelz and Andrews (1964) would appear appropriate but later work (Duncan, 1969) casts some doubt on the conclusiveness of the method.

3. The operationalization of these variables by means of the student's report of the situation raises a familiar problem. It is conceivable that as a result of cognitive consonance processes at work within the student the reported aspirations/expectations of reference groups are contaminated (distorted) by the student's own aspirations. Such a situation is problematic in at least two ways:first, while these perceptions may be real to the student and real in their consequences for him they represent the actual expectations/aspirations to an unknown degree and, by so doing make questionable interpretations that attribute direct influence to these groups. Second, the fact that these perceptions may tend toward consonance as a result of distortion within the individual has possible consequences in the form of excessive collinearity between these variables such that the effect estimates (path coefficients) become increasingly unstable and artifactual (see Blalock, 1963, and Gordon, 1968).

   Almost without exception the literature in this area bases its conclusions on data such as this, making the (often implicit) assumption that what the student reports to be so, is so in reality. What evidence there is for the validity of student report data is largely unpublished. Sandis (1967) provides evidence for substantial congruity between mother's educational expectations and the student's report of the same, approximately 78% of the students reporting their mothers expectations correctly. A moderate degree of interaction with parental education was found in this instance, students with well educated parents fairing a little better in their perceptions of what their mothers expect. Furstenberg (1967) also provides evidence that, at least for mobility orientations (occupational and educational goals), the majority of students perceive their parents expectations accurately.

   While the above is hardly the last word on this matter it is at least support for the assumptions made in this connection, namely, that the student's report of these expectations/aspirations are a reasonably accurate reflection of those actually held by the reference groups in question.

4. This only holds for models with simple one-way causation (recursive models).

Somewhat more elaborate statistical procedures are required when reciprocal causation is built into the models (see Duncan et al., 1968).

5. These assumptions, and others, must be made in order to solve the system of equations for the values of the path coefficients. The assumptions necessary vary from model to model according to the form of the model proposed. Note here that the longitudinal nature of the present model leaves the validity of some of these assumptions open to question. It seems likely that the unspecified causes of a variable at time one would be related to their counterparts at time two, for example, in Figure 1 X_f and X_a or X_e and X_j; that is, the assumption $r_{af} = r_{ej} = \text{etc.} = 0$ may not be accurate.

6. The absence of a direct connection between two variables may not mean that they are causally unrelated. A variable (A) appearing early in a causal sequence may exert all its influence indirectly on (D) through the intervening variables (B) and (C). In this sense (A) is an important cause of (D) because it is a cause of the two causes of (D). This is the concept of an indirect effect.

7. One might argue that such an assumption is not warranted given the high non-response rate and that, in fact, the data are virtually useless. On the other hand, because the data have the potential to provide new insights into areas relatively unexplored it is argued that conclusions made in this respect (but with some reservations as to their quantitative accuracy) serve a useful function, even though it be only to suggest the nature of basic processes and where further research might be directed.

8. This is a useful rule of thumb more than a statistical procedure. Models may in fact be made more parsimonious by further deletions or may require that some of the deleted paths be replaced. The test of the adequacy of a model is the degree to which the correlations implied by the system of relationships therein approximate the observed correlations. A further rule of thumb is applied in this instance; implied correlations ought not to differ by more than 0.050 from the observed values.

9. Implied correlations may be calculated using the standard path analysis theorem

$$r_{ij} = \sum_q p_{iq} r_{jq}$$

where i and j denote two variables in the system and q is an index running over all variables from which paths lead directly to X_i. Thus in calculating the implied correlation between parents' expectations and school achievement (X_8 and X_{10}), i = 8, j = 10 and q runs from 10 to 12 (X_{10}, X_{11} and X_{12} all affect X_8), such that

$$r_{8.10} = p_{8.10} r_{10.10} + p_{8.11} r_{10.11} + p_{8.12} r_{10.12} + p_{8h} r_{10.h}$$

Now, $r_{10.10} = 1$ and $r_{10.h} = 0$ by assumption, thus

$$r_{8.10} = p_{8.10} + p_{8.11} r_{10.11} + p_{8.12} r_{10.12}$$

The implied correlations $r_{10.11}$ and $r_{10.12}$ must be used in the equation rather

than the observed values. Where all possible paths are present for both variables the implied correlation between them will always be equal to the observed value, as in the case of $r_{8.10}$. When paths to one or both are deleted the implied correlation may or may not be equal to the observed. The implied correlation matrix defined by X_7 to X_{12} is illustrative of the first case in which all paths are present. The implied correlations involving X_1, from which four paths have been deleted, illustrate how implied correlations may deviate from their observed values.

10. An examination of the correlation matrix bears out the earlier prediction of substantial collinearity between measures of the aspirations of the student and the expectations of his parents and teachers but not, however, in connection with the aspirations of peers. It is argued that these negative effects are in fact statistical artifacts produced as a result of the particular internal properties of the correlations matrix. One would be hard put to give a substantive interpretation to these negative effects.

Gordon (1968) has demonstrated in some detail the manner in which the particular pattern of relationships within a correlation matrix can influence the regression coefficients produced. He has shown the manner in which high correlations among independent variables in a particular sub-set and/or differentials in the number of highly related variables between weakly related sub-sets, together with differential relationships with the dependent variable, can influence the size of the regression coefficients produced and hence, that the interpretation of relative effects on this basis may be in error to some degree.

The intercorrelations between the variables seen as causes of the student's aspirations show the repetitiveness and redundancy discussed by Gordon (1968:597) and, on this less than conclusive basis, the negative effects in question will be considered artifactual. By implication one must also entertain some doubts about the accuracy of some of the less substantively bothersome effects.

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FIGURE 1. CAUSAL ORDERING OF THE VARIABLES.

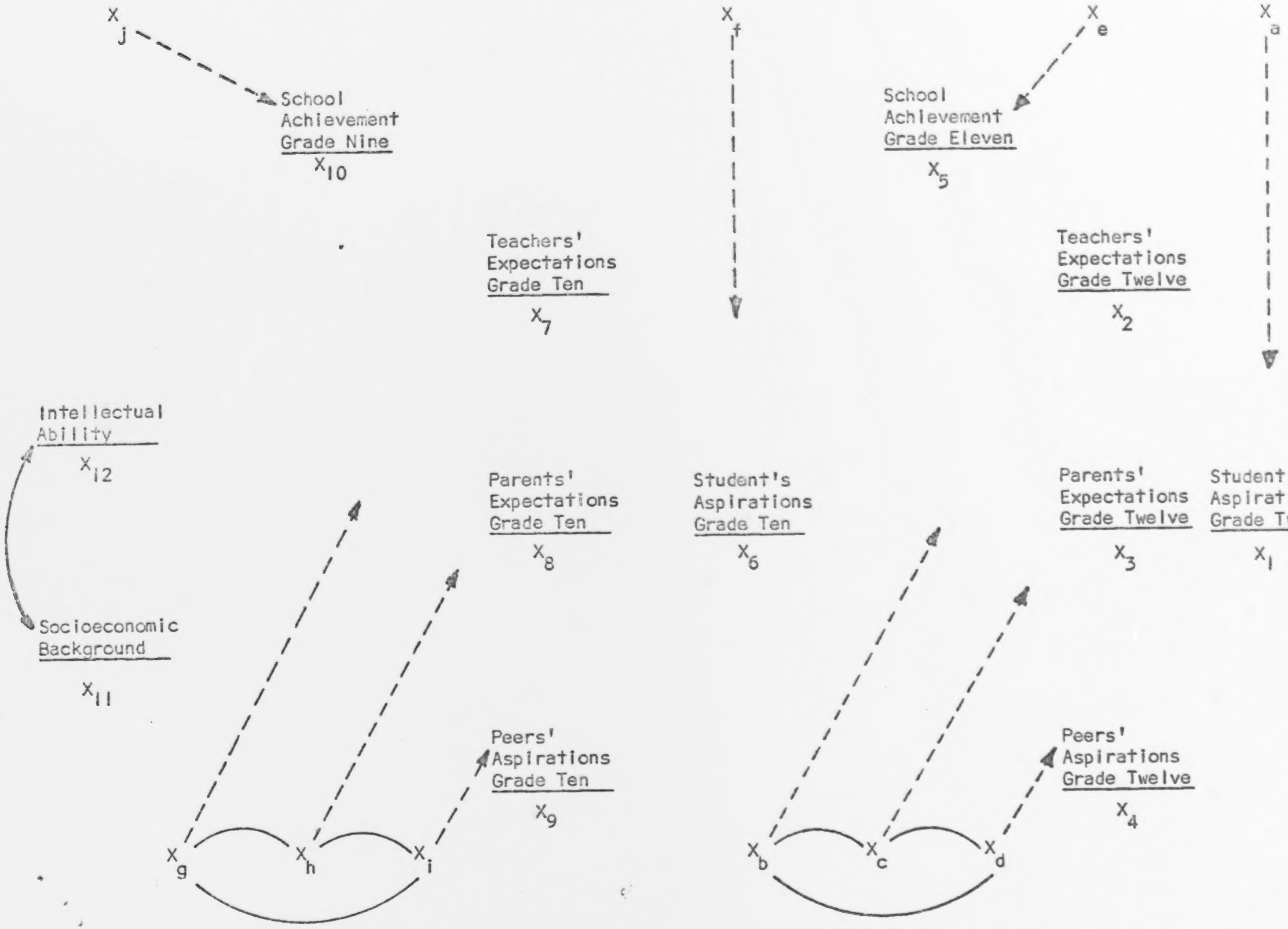

FIGURE 2. SIMPLIFIED PATH MODELS (SHOWING ONLY PATHS OF 0.150 OR GREATER).

FIGURE 2a. MALES.

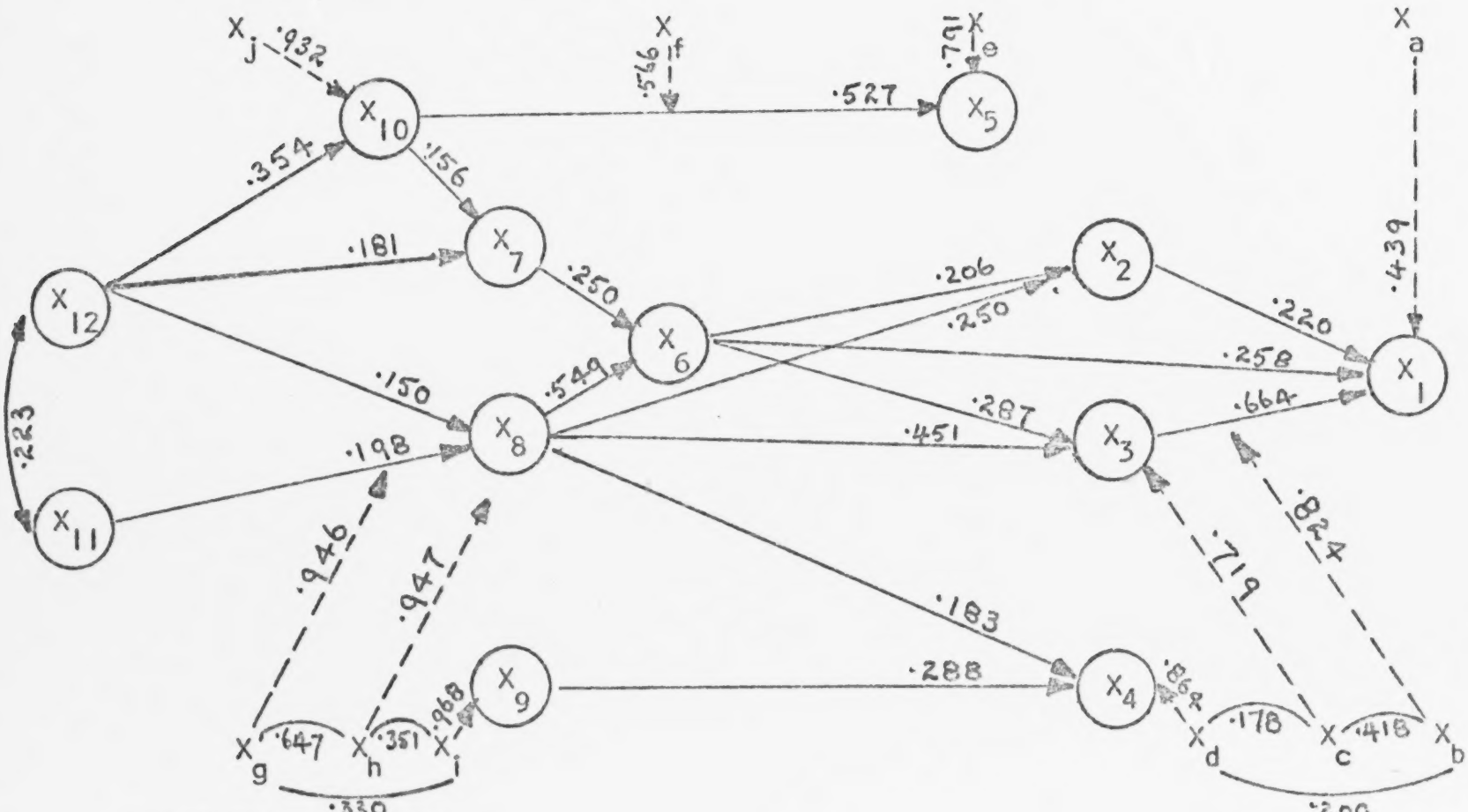

FIGURE 2b. FEMALES.

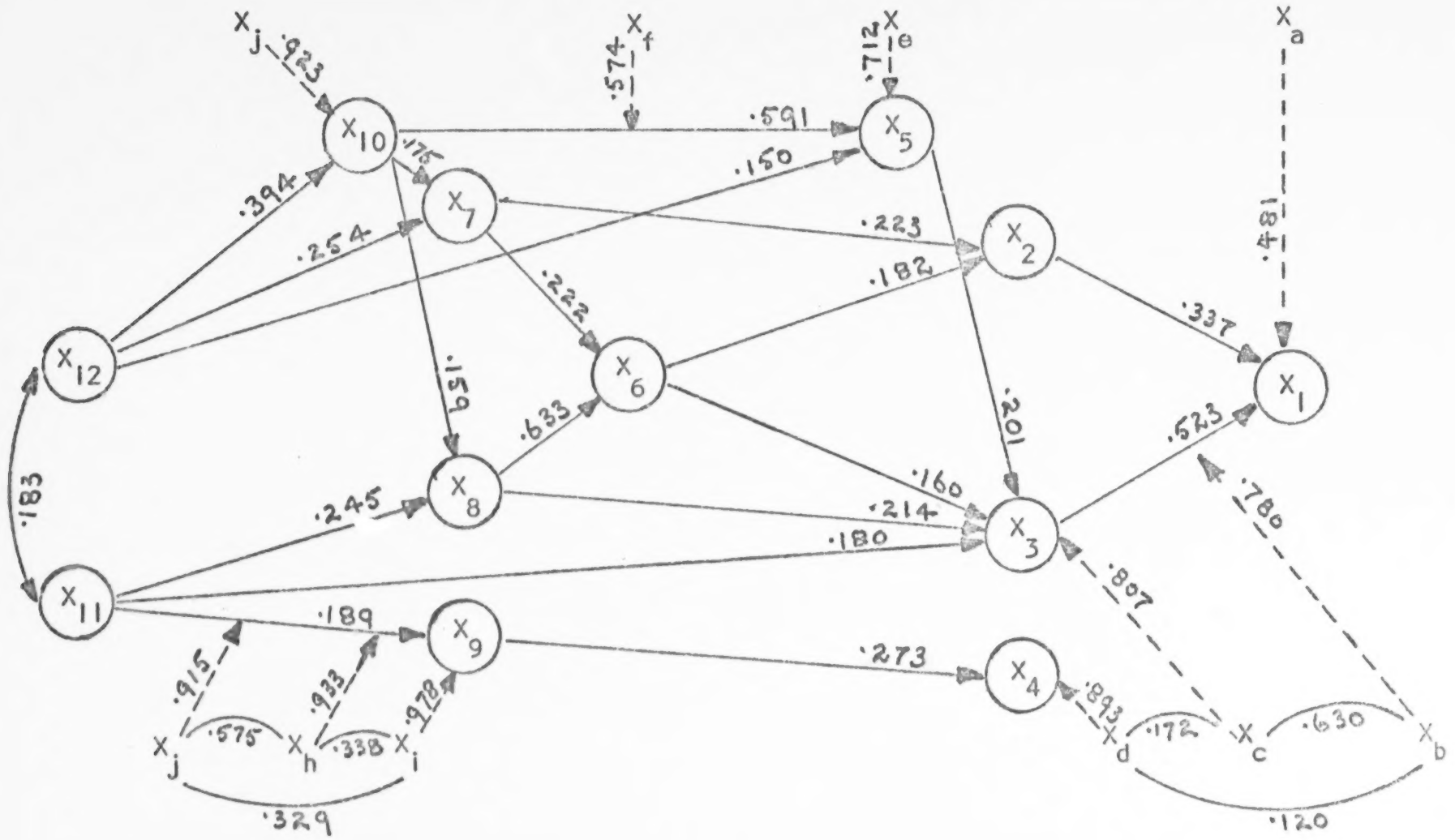

TABLE 1. CORRELATION MATRICES AND NON-RESPONSE*

	X(12)	X(11)	X(10)	X(9)	X(8)	X(7)	X(6)	X(5)	X(4)	X(3)	X(2)	X(1)	percent non-response males
X(12)	*	.223	.362	.182	.233	.264	.295	.345	.174	.249	.276	.241	2.9
X(11)	.183	*	.115	.179	.244	.177	.243	.146	.189	.221	.138	.237	16.0
X(10)	.385	.021	*	.164	.184	.253	.252	.591	.180	.223	.261	.262	16.1
X(9)	.163	.209	.124	*	.402	.381	.448	.193	.422	.373	.336	.387	31.2
X(8)	.231	.271	.212	.396	*	.680	.785	.155	.394	.657	.498	.566	15.7
X(7)	.347	.188	.275	.383	.624	*	.689	.191	.360	.455	.437	.391	47.3
X(6)	.248	.248	.222	.398	.796	.641	*	.209	.399	.630	.507	.634	15.9
X(5)	.412	.110	.676	.126	.235	.315	.242	*	.145	.217	.215	.252	6.6
X(4)	.188	.232	.204	.371	.242	.303	.269	.212	*	.419	.411	.458	32.2
X(3)	.227	.317	.264	.246	.496	.427	.484	.339	.332	*	.626	.861	23.8
X(2)	.323	.253	.369	.248	.478	.508	.499	.395	.391	.752	*	.685	43.9
X(1)	.258	.308	.299	.285	.466	.438	.514	.360	.395	.832	.787	*	24.5
percent non-response females	1.7	16.1	16.3	26.6	17.6	45.6	16.7	6.5	30.2	25.3	45.8	26.9	

* males above the diagonal, females below the diagonal

TABLE 2. PATH COEFFICIENTS

Dependent Variable (effect)	Independent Variables (causes) X(12)	X(11)	X(10)	X(9)	X(8)	X(7)	X(6)	X(5)	X(4)	X(3)	X(2)	Residual
					MALES							
X(10)	.354	.036										.932
X(9)	.112	.142	.107									.968
X(8)	.150	.198	.107									.947
X(7)	.181	.119	.156									.946
X(6)	.080	*	*	.118	.549	.250						.566
X(5)	.139	*	.527	.082	*	*	*					.791
X(4)	*	.068	.068	.288	.183	.097	*	*				.864
X(3)	*	*	*	.084	.451	-.099	.287	.089				.719
X(2)	.097	*	.110	.107	.250	*	.206	*				.824
X(1)	*	*	*	*	-.128	-.134	.258	.041	.079	.664	.220	.439
					FEMALES							
X(10)	.394	-.051										.923
X(9)	.096	.189	.083									.978
X(8)	.125	.245	.159									.933
X(7)	.254	.138	.175									.915
X(6)	*	*	*	.063	.633	.222						.574
X(5)	.150	*	.591	*	*	.100	*					.712
X(4)	*	.147	.130	.273	*	.135	*	*				.893
X(3)	*	.180	*	*	.214	.094	.160	.201				.807
X(2)	*	.121	.146	*	.096	.223	.182	.147				.780
X(1)	*	*	*	*	-.086	*	.134	*	.101	.523	.337	.481

* indicates a negligible direct effect

TABLE 3. DEVIATIONS OF IMPLIED CORRELATIONS FROM OBSERVED CORRELATIONS*

	Variable											
	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)	X(9)	X(10)	X(11)	X(12)
X(1)	*	.001	.003	.017	.012	.005	.007	-.001	.010	.046	.063	.003
X(2)	.006	*	.005	.010	.017	.005	.033	-.002	.000	.009	-.021	.001
X(3)	.006	.010	*	.011	.004	.003	.000	.000	-.001	.037	.042	.039
X(4)	.009	.085	.006	*	-.007	.030	.001	.000	.000	.000	.000	.014
X(5)	.033	.011	.015	.036	*	.022	-.001	-.007	-.001	.000	.040	.000
X(6)	.012	.014	.020	.014	.023	*	-.001	.000	-.001	.044	.026	.000
X(7)	-.020	-.001	.000	.000	.000	.000	*	.000	.000	.000	.000	.000
X(8)	.015	.011	.011	-.018	.013	.053	.000	*	.000	.000	.000	.000
X(9)	.010	-.011	-.004	-.001	-.010	-.001	.000	.000	*	.000	.000	.000
X(10)	.019	.002	.021	.000	.000	.019	.000	.000	.000	*	.000	.000
X(11)	.037	.011	.013	.000	.051	.022	.000	.000	.000	.000	*	.000
X(12)	.012	.042	-.008	.020	.000	.014	.000	.000	.000	.000	.000	*

* (i) deviation = (observed correlation - implied correlation)

(ii) males above the diagonal, females below the diagonal